A.2.3. Overview of Available Endoscopes and Instruments for Endoscope-Assisted Microneurosurgery

Most of the present neuroendoscopes are developed for the use in the ventricular system. Nevertheless, there are also some other types of lenscopes and fiberscopes especially designed for the use in endoscope-assisted microneurosurgery.

From Aesculap (Tuttlingen, Germany) there are two types of endoscopes. The first one is the Neuroscope according to Perneczky, which is a fiberscope formed like a neurosurgical instrument. It should be considered as a "viewing dissector". It has a total length of 1600 mm, a distal diameter of 1.4 mm, a field of view of 80^0 and a 0^0 direction of view.
The second one is the Angled Neuroscope™, which is a lenscope with a 90^0 angled eyepiece and an outer diameter of 4 mm. The attachment for the light cable is at 110^0. So the eyepiece and the light cable are out of the way which allows easy introduction between craniotomy opening and microscope with an unobstructed microscopic view along the shaft of the endoscope. It is available with a 0^0, 30^0 and 70^0 angle of view (Fig. 5).

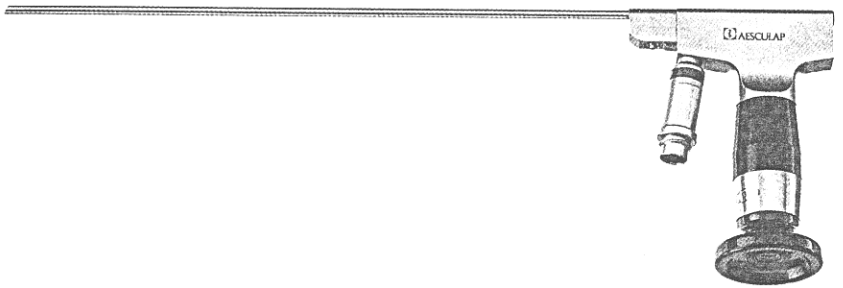

Fig. 5. Angled Neuroscope (Aesculap) with eye-piece in a 90° angle and a 30° angled front lens (also available with 0° front lens).

The new generation of the Angled Neuroscope™, which has a smaller diameter of 2.7 mm, is integrated in the so-called MINOP™-system, consisting of especially designed trocars which can hold different lenscopes and instruments (Fig. 6).

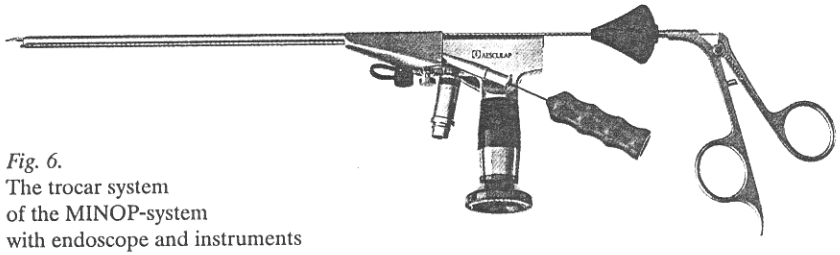

Fig. 6.
The trocar system
of the MINOP-system
with endoscope and instruments
(grasping forceps and
bipolar diathermy probe).

The whole system can be fixed tightly in a pneumatically driven self-retaining arm, the so-called UNITRAC™ (Fig. 7).

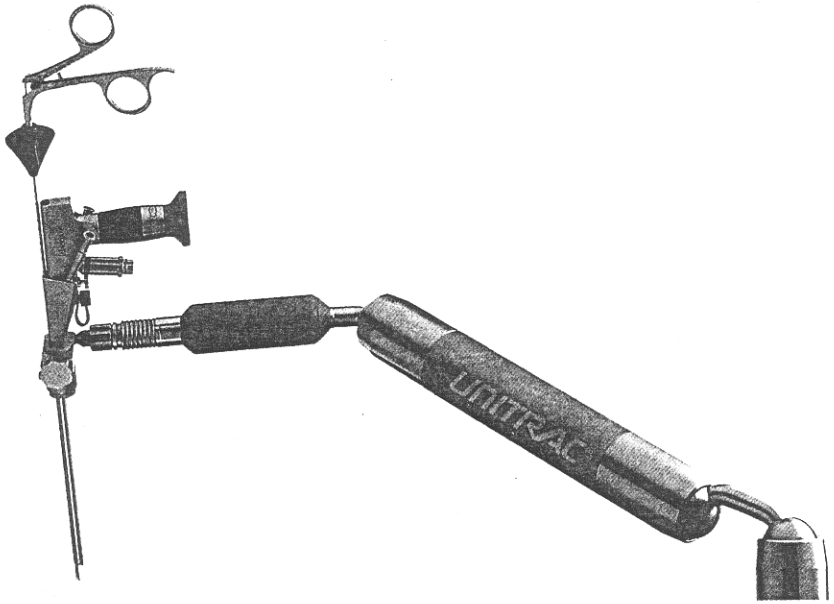

Fig. 7. The UNITRAC fixation device, a pneumatically driven retractor arm to securely hold the trocar system with endoscope and instruments.

Most navigation systems nowadays can adapt to a variety of instruments, like an endoscope (Fig.8).

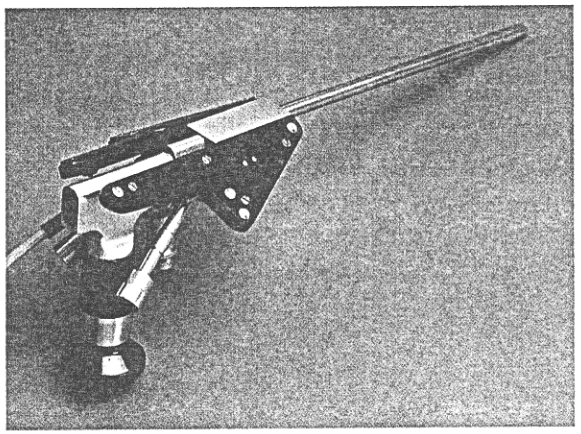

Fig. 8.
Fixation of LED-sensors
of the neuronavigation
system to the endoscope.

From Zeppelin (Pullach, Germany) comes the so-called Cranioscope™ according to Urban, which has an eyepiece and irrigation/working channel that is angled 120^0 off the shaft with a viewing angle of 30^0 and a viewing width of 105^0 (Fig. 9).

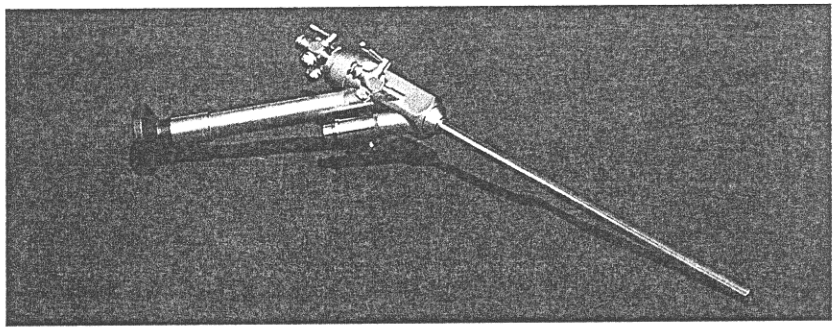

Fig. 9. The Cranioscope™ (Zeppelin).

They are available in three different types: the Mini-Cranioscope™, with a shaft diameter of 3 mm and an optical diameter of 1.7 mm, the Cranioscope-I™ with a shaft diameter of 5 mm and an optical diameter of 2.87 mm plus a working channel of 1.1 mm and an irrigation channel of 1.0 mm and the Cranioscope-II™, which is the same as type I but without working and irrigation channels.

An also very useful and easy to handle type of endoscope with a small diameter of only 2.3 mm, is the so-called MurphyScope™ (Medtronic/PS Medical, Goleta, CA, USA, formerly distributed by Clarus Medical Systems, Minneapolis, USA), a disposable fiberscope, which is available in different shapes with a length of 160 mm. Some of the MurphyScope™ -types are malleable and, in contrast to the just mentioned neuroscopes, they do have an irrigation channel, which is a distinct advantage (Fig. 10).

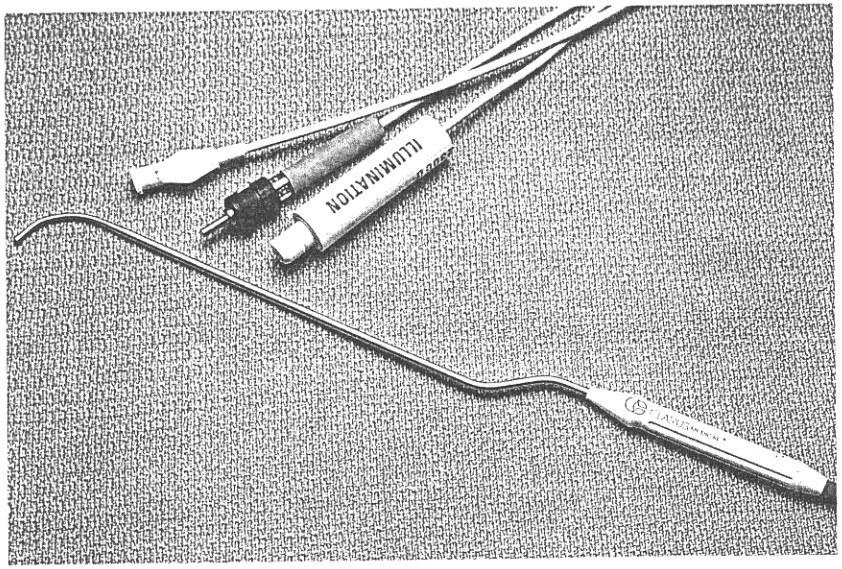

Fig. 10. The MurphyScope™ (Medtronic/PS Medical).

The usual design of micro-instruments is difficult for keyhole approaches. E.g., a bipolar forceps or a micro-scissor will be closed at its tip when the target is reached because it is already pushed together by the edges of the small craniotomy opening.
But now there are instruments available from Synergetics (Chesterfield, Mo, USA), the so-called TruMicro™ instruments, which have an ultra low profile shaft and tip design which results in 70 % less instrument mass at the operative site (Fig. 11).

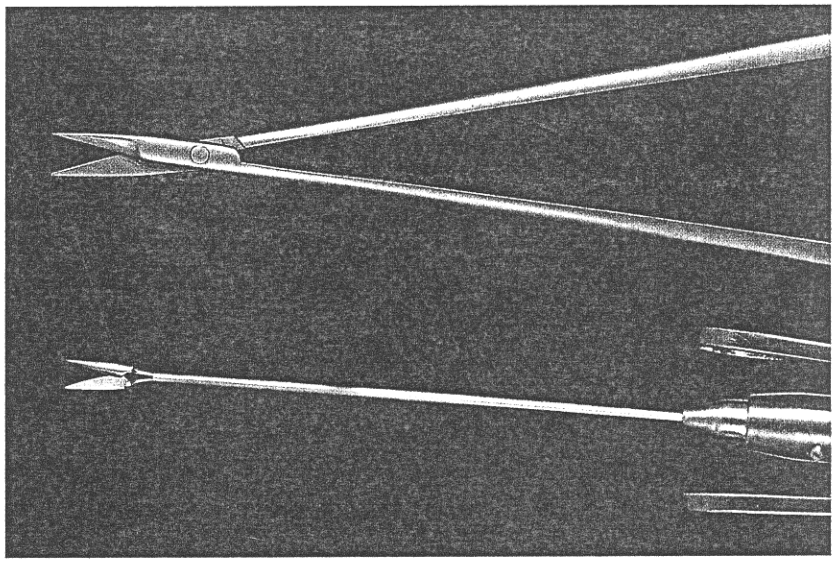

Fig. 11. Comparison of the slender shaft of the Tru-Micro™ scissor (Synergetics) with a conventional micro-scissor. The difference in space needed for introduction of the instrument is obvious.

It allows for an operating corridor of much reduced size, producing clearly improved visibility and access. By noticing that usually only the last 2-3 millimetres of a scissors blade are actually used by a neurosurgeon, their blade size hence was reduced which also improved vision, range of motion and access. E.g. the Spetzler TruMicro™ scissors with either straight or 5 degrees curved blades are provided with working lengths of 25mm, 55mm, 80mm, and 100mm.

The Dacey TruMicro™ scissors (with the same working lengths) are vertical cutting scissors. Their guillotine action allows for tissue first to be isolated, elevated, and then incised. There are three configurations: the BackCutter (45 degree), the SideCutter (90 degree), and the DownCutter (135 degree) (Fig. 12).
The tip of the instruments is rotatable independent of the handle, so the tip position can be optimized, which, in turn, also optimizes ergonomics for the neurosurgeon.
These instruments are, at present, the best available instruments for use in endoscope-assisted procedures through keyhole approaches.

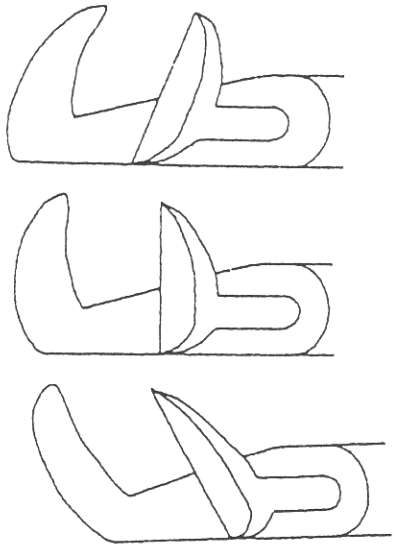

Fig. 12. Principles of the Tru-Micro™ Dacey cutters.